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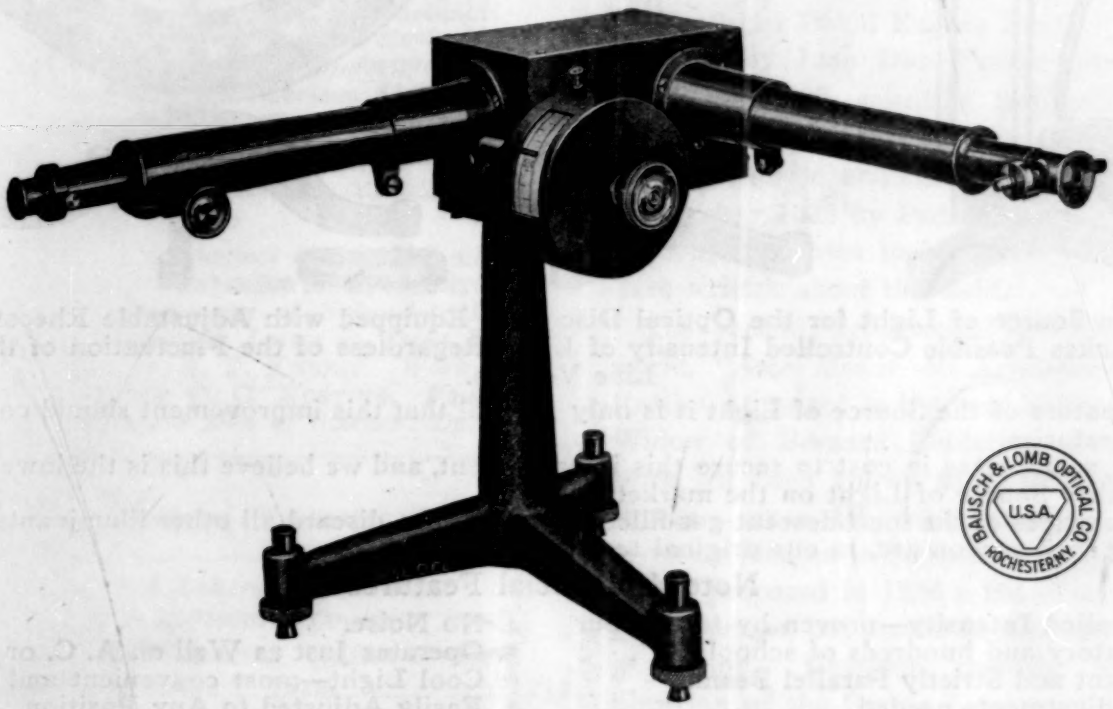

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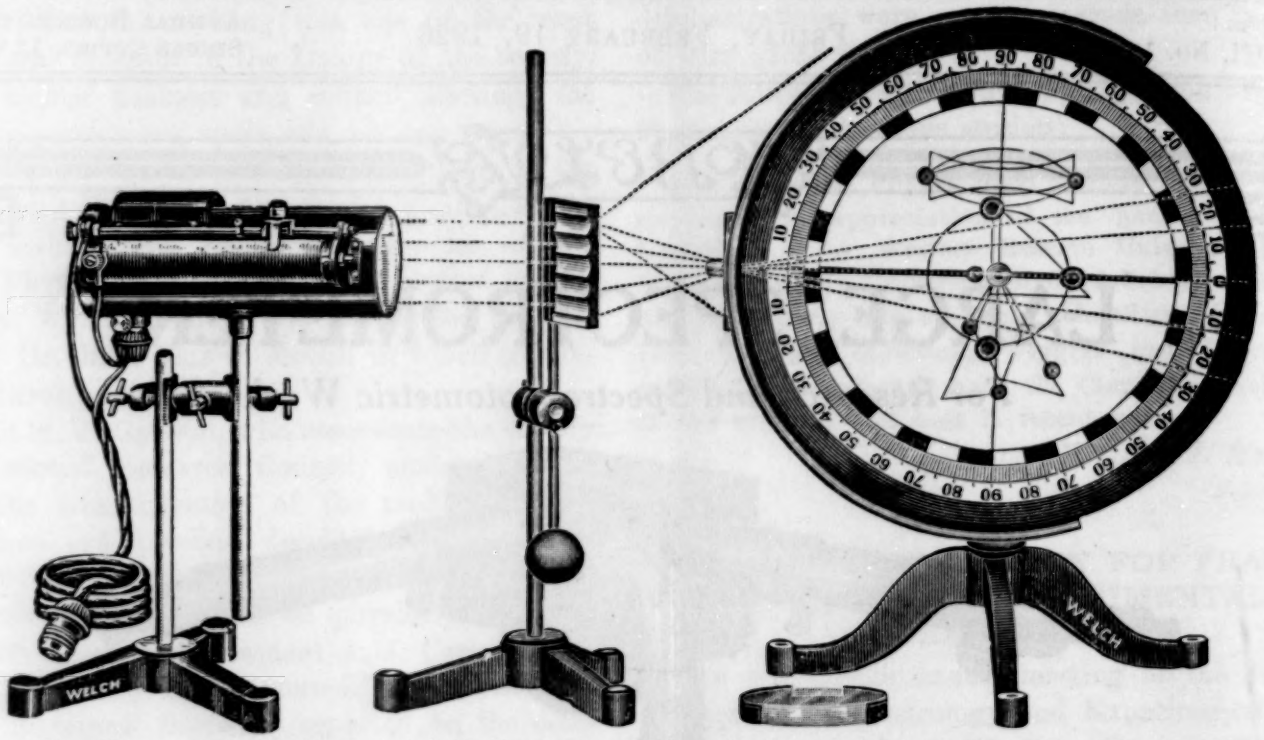

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SCIENCE

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THE EARLIEST KNOWN AMERICAN ARITHMETIC[1]

THE American activity of the printing press began in Mexico about the year 1539, Juan Pablos being the first printer. From this press issued in 1556 a work on the value of silver and gold by Juan Diez Freyle, who devoted in his treatise considerable attention to both arithmetic and algebra. This section, with brief notes and translation, has been published in facsimile by Professor David Eugene Smith. A year after the Sumario by Juan Diez Freyle appeared a work on astronomy, and scientific publications of America begin with these works.

A systematic arithmetic was published at Mexico in the year 1623 by Pedro Paz. At the present time no copy is known to historians of mathematics who have written about this field.

The second arithmetical text-book of the new world, "Arte Menor de Arismetica," by Atanasius Reaton, appeared in the year 1649 at the press of the Widow of Bernard Calderon. Some copy of this work has been known to Spanish-American bibliographers, since the bibliographical description was given by Medina in his bibliography of Mexico. The writer prepared in 1924 a list of arithmetics of colonial America, but search at that time failed to locate any copy. However, recently Mrs. Lota Spell, librarian of the Garcia Library at the University of Texas, called my attention to the fact that a copy of this arithmetic is in this library and has very courteously assisted me in obtaining a reproduction by rotograph.

The work is dedicated to Pedro de Soto Lopez, "Contador del Tribunal del S. Oficio de la Inquisicion de esta Nueva Espana, Prior de la Universidad de los Mercaderes deste Reyno, I vez Administrador de las Reales Alcavalas." The approbation of Contador Martinez de Zuvieta, representing the Visitor General of the Holy Inquisition, is given. Herein Atanasius Reaton receives also the title Contador or Accountant. The Licence based upon the approbation was duly issued on December 17, 1648.

In his prefatory letter to the reader Reaton notes that twenty-one years before he had prepared a book, Contador General, de Arismetica, y Geometria, for

[1] Address of the vice-president and chairman of Section L—Historical and Philological Sciences—American Association for the Advancement of Science, Kansas City, Mo., December, 1925.

which license to print had been given. However, the difficulties of printing in the new world induced him to send the book to Spain. But this venture was also a failure and the work was not printed.

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Capitulo	XXI.	De las Companias, y quantas eſpecies ay de ellas, fol. 44.
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Capitulo	XXIII.	Del orden que se ha de tener para formar campos, fol. 52.
Capitulo	XXIIII.	De algunas Quaeſtiones de Ariſmetica, fol. 68.

Note that Sumar, Restar, Multiplicar and Partis are the names of the four fundamental operations, termed "Reglas Generales" in chapter six.

Fractions, or "Quebrados," are treated in seven chapters, following upon a brief discussion in chapters seven and eight of denominate numbers, largely confined to money with a passing mention of weights.

Progressions and proportion are followed by the rule of three, without time and with time. Two chapters are devoted to partnerships and one to extraction of square root—the formation of military companies which is mentioned in the title occupies a large chapter, followed by a final chapter on diverse arithmetical problems.

At the John Carter Brown Library is a copy of another arithmetical work, published in Mexico in 1675 by Benito Fernandez de Belo. An examination of a photostat copy obtained through the courtesy of Dr. Lawrence C. Wroth, librarian at the John Carter Brown Library, reveals the interesting fact that the fundamental operations of arithmetic are not touched, but the whole book is devoted to the formation of companies of soldiers in squares, in hollow squares, in hexagonal formation and in other strange geometrical forms.

Noteworthy in Reaton's work is the fact that the author refers to several well-known early authorities on arithmetic, mentioning by name the following: Sacrobosco, Juan Andres, Buteo, Siliceus, Ortega, Yciar, Perez de Moya, Gemma Frisius, Antich Rocha of Gerona, frequently Miguel Geronimo de Santa Cruz and two others, Juan Antonio and Juan Gramatico, whose works are not known to me. He cites frequently also the *Contador General*, probably his own larger work mentioned above.

In numeration the use of Cuento for million is interesting, as the term appears only in Spain. Numbers 1, 2, 3, . . . are placed over the seventh, thirteenth and nineteenth places, respectively, to indicate that the number is to be read millions, millions of millions, and millions of millions of millions, respectively. Several writers of the thirteenth and fourteenth century placed dots over the fourth (thousands), seventh (thousands of thousands), tenth, and further places increasing each time by three, to indicate how many times "thousands" is to be repeated.

In addition and in the other operations the author gives a kind of moving picture of the operation, exhibiting graphically the various stages in the process. The methods of addition, subtraction and multiplication are remarkably similar to the modern ones. Division is different in that the author writes the remainders without writing the partial products. This is now termed the Austrian or additive method of division and is usually associated with the Austrian or additive method of subtraction.

This method of division without writing the partial products appears in only a few text-books of the seventeenth century. D. E. Smith mentions Cataldi's work of 1602 in which the process appears. I have found the process, without explanation, in Zuchetta's "Prima parte della Arimmetica," published at Brescia in 1600. In this treatise only the applications of arithmetic appear, but wherever Zuchetta divides this process is used. For example, 10865 divided by 128 appears simply as:

10865
625
113

The quotient 84 appears entirely separated from the

dividend, in the answer to the problem in question. Here it is to be noted that the partial products 8×128 or 1024 and 4×128 or 512 do not appear at all, but are subtracted immediately, leaving as remainders 62 and 113, which are written down directly.

A problem on fol. 5 verso reads as though from a recent American text-book.

John owes Peter 2386 pesos. He has received from Peter 295 pesos. The question, how much will he owe John. Place the numbers as you have been told above, and it appears here.

	Deue	2386 pesos	2386 ps
	Pago	295 pesos	295 ps
			1
2386 ps	Deue	2386 pesos	
295 ps	Pago	0295 pesos	
91	Resta	2091 pesos	

The explanation is lengthy, borrowing one above and decreasing the upper digit, which is even to-day the most common method in America.

The multiplication table is in column form, with nine entries in the table of ones, and decreasing to two entries, "8, 8. 64" and "8.9. 72" in the table of 8's, closing with 9 times 10 and finally "10. 10. 100."

Historically, the most interesting section in the book is the final chapter which treats in detail the method of distribution of the income (tithes) received by the Mexican churches. Application is made to the income (assumed) of the Cathedral of the Puebla de los Angeles. This minute account of the allocation of the considerable funds received by the churches of New Spain presents material probably not found in any historical work and yet of the greatest historical value in the discussion of the Spanish empire in America where the priests played so large a rôle. Such discussion appears also in the arithmetic of Pedro Paz, indicated by the preface which has been published by Medina.

This arithmetic is indeed a precious document in the history of science in America, revealing a breadth of interest in arithmetic not to have been expected in Mexico at this period.

LOUIS C. KARPINSKI

UNIVERSITY OF MICHIGAN

THE SCIENTIFIC METHOD AND AUTHORITY. II[1]

DISTRUST OF SCIENCE

Another phase of anti-science emotionalism, not always assuming the attitude of actual hostility, but better described as suspicion or distrust of science, may be noticed briefly. This is evidenced by the charges which are made, violently and even abusively by the uncultured, seriously and earnestly by cultured church leaders, against some of the teaching in our colleges and universities. These charges, so far as I have found them specific, are to the effect that certain young men and young women, following upon their university courses, not always in the physical sciences, however, such subjects as philosophy and sociology also being censured, have become so unsettled in their beliefs that even the ethical standards of some of them have been distinctly altered.

That some students, whose early training had led them to regard the mythical portions of Canonical Scriptures as veritable history and inseparable from the ethical values of those writings as guides to right living, when they become acquainted with the truths which science has brought to light may, in that period of revolt through which all active-minded youth is apt to pass, speak words which seem to be disturbing to well-established ways of thinking, is not a matter of wonder, nor should it be an occasion for alarm. Not all the young people who are exposed to new knowledge suffer mental distress in adjusting themselves to the changed outlook thus necessitated; and not all the young people whose formal intellectual training ends with the high school live lives that are above reproach.

I have had the pleasant experience of associating with many college and university young people through a long series of years, and find nothing in their manner of life to give me uneasiness for the future which is to be moulded by their influence.

Some attempts have been made by the somewhat doubtful method of questionnaires to discover how much basis there is for the charges which have been made that the teaching of biological facts and theories is damaging to religious beliefs. These inquiries thus far seem to give the rather surprising result that such courses tend to strengthen rather than weaken Christian faith. Thus a case reported by Goldsmith[10] resulted in sixty-six reporting that their Christian faith had been strengthened, twenty reported no effect, one way or the other, and two said it had been weakened. Many of the first group told in what ways their faith had been strengthened but, unfortunately, neither of the two whose faith had been weakened told in what way, or to what extent damage had been done.

From a rather extensive acquaintance with teachers of science, more particularly of the biological sciences, I feel warranted in saying that not one of them would intentionally present his subject or arrange his laboratory courses in any other way than

[1] Address of the retiring vice-president of Section F—Zoology—American Association for the Advancement of Science—given at Kansas City, December 29, 1925.

[10] "Evolution versus Christianity," p. 34.

as tending toward the building up of the highest type of character in his students.

Indeed, I am inclined to think that it was intimacy with such characters as are to be found among teachers of science which led a recent clerical writer to say: "It is perhaps not in the churches that the best mind and conscience of our age is to be found."[11]

I may be permitted to remark that there must be something out of adjustment in a system of primary and secondary education, the product of which, after having been trained therein until near maturity, is in danger of experiencing agony of spirit when he attempts to bring the instruction in tradition which he has received, into harmony with facts with which he becomes acquainted in a few weeks' study of natural processes.

But who can forecast with any degree of confidence the outcome of such present-day portents as those which we find in the publications of The Science League of America? Thus, two examples out of many:

A New Jersey minister says: "We are not going to stop until we have driven every Modernist out of our pulpits and seminaries and editorial chairs. We are going to put them out *if it takes our lives to do it.*"

A Kansas City minister, speaking at a Christian Endeavor meeting at Denver, announces: "Worse than an assassin who kills the body is he who shatters the faith of youth"—in which characterization he includes the Modernists, whatever their personal religious views. He goes on to say that rape-fiends are burnt, but they are saints in comparison with the teachers of modern science.

One is curious to know how this proposed burning of Modernists, as a part of the agenda of the Christian Endeavor movement, was received by that audience.

Then there are those examples of what come perilously near pulpit profanity which one now and then sees in newspaper reports of sermons. Thus the Reverend William Ashley Sunday, in a sermon delivered in Los Angeles, is reported to have said: "If a minister believes and teaches Evolution, he is a stinking skunk and a liar." Again he said: "The consensus of scholarship can go to hell for all I care"; and again "Old Darwin is in hell."[12]

Maynard Shipley has this to say, which, since it is drawn from his own experience, commands attention:

Any one who has faced, as the President of the Science League has done, 5,000 furious Fundamentalists, laughing aloud at the simplest scientific statement, and roaring and howling their rage at the slightest opposition to the ignorant and prejudiced statements of their spokesman, will realize the grave danger involved in such utterances as those just quoted. Every one of these Fundamentalists is a voter, and they will all vote against evolution. We shall be fortunate if they do not carry the lynching spirit incited by their speakers and writers to an even more extreme point than the passage of anti-evolution laws.

He continues:

The Fundamentalist geologist Price has even gone so far as to attack the U. S. Coast and Geodetic Survey as "a wholesale official propaganda in favor of the evolution theory," and to suggest thus a new point of attack on science. The Smithsonian Institution and the Bureau of American Ethnology are also under Fundamentalist attack.

I still have an abiding confidence that there exists a large enough measure of common sense in the American people to avert the appalling calamity which a general belief in such ravings as those which I have just cited portends. Perhaps I am over-confident; if so, then a cynical passage in Voltaire's "A Dialogue" has application:

Diogenes: . . . So long as it endures the world will continue to be ruled by Cajolery, by Injustice and by Imposition.

Mr. Loke: If that be so I must take leave to lament the Destiny of the Human Race.

Quite a different note is sounded by the editor-in-chief of the *Christian Herald,* who, in an article in the *Atlantic Monthly* for October last (p. 468), says:

Jesus never said a word about evolution, about His own birth, about the absolute inerrancy of the Scriptures, about the necessity of assenting to a long doctrinal creed before one could be called a Christian and be saved. In His tremendous picture of the Last Judgment He based the final destiny of mankind on the way mankind had behaved, not on doctrinal or theological beliefs.

Having in mind some of the "fundamentals" of which St. Paul either had never heard, or at least did not think of sufficient importance to mention in any of his writings that have been preserved, I asked a member of the faculty of one of our best known theological seminaries, whom I chanced to meet last summer, what chance St. Paul would have of being received into a present-day Fundamentalist communion. His answer was, in effect, that he would not have a ghost of a chance.

SOME RECENT ANTI-SCIENCE LITERATURE

Time can be taken for no more than a brief consideration of the literature which has appeared of late, reopening a controversy which the informed por-

[11] Rev. Alfred Fawkes, *Contemporary Review,* Vol. 115, p. 299.

[12] "Science versus Dogma," pp. 144–5.

tion of the public supposed had been settled as much as a generation ago. My predecessor, of a year ago, discussed examples of this thrashing over of old straw by the ill-informed and the prejudiced. No comments on that literature, whose futility Dr. Rice so ably demonstrated, will be made in this paper.

At the outset of these brief comments I must be permitted to express my deep sense of shame and confusion, as a member of the organized church, when I see publishing houses of respectable Christian denominations either recommending to their readers, or actually issuing books which are obscurantist and misleading in high degree, and, worst of all, liable to lead properly informed people to judge the church by the low standard of knowledge which this misinforming and baneful literature sets.

There, for example, is the booklet "Evolution a Menace," by the Reverend J. W. Porter, and published by the Baptist Book Concern, of Louisville, Kentucky. After reading this little book, including the amazing dedication, in which the author suggests a much more formidable dogma than that proclaimed by Pope Pius IX, known as the immaculate conception, I wrote the following letter, which, however, was never sent, but is here produced as an open letter to all publishers of such intemperate, anti-science literature:

Dear Sirs:

I have read Porter's "Evolution a Menace," a copy of which you kindly sent me at my request, and am moved, as my Quaker forebears would have put it, to write you a brief note concerning it.

First let me say, by way of introduction, that I am a member of the Presbyterian Church, and taught Biology and Geology in Washington and Jefferson College, from 1882 until my retirement in 1920.

If I were hostile to Christian theology, which I am not, I have difficulty in imagining a greater injury that I could inflict upon it than to circulate "Evolution a Menace" among students in our better colleges and universities.

We who are older can be patient with ignorance, and feel only sorrow when, with the best of intentions, and in the best of causes, although not always in the best of tempers, some zealot undertakes to pronounce judgment without adequate information. But the young are not apt to be so charitable, and one who is acquainted with the interpretation of such facts as disturbed geological strata, would not only give the author of "Evolution a Menace" a very low rating in geology, after reading portions of Chapter III, for example, but finding him so ignorant of the things that are seen, might in addition doubt his fitness to testify of things unseen.

After reading "Evolution a Menace," I read George McCready Price's "The New Geology," and immediately absolved the Rev. Mr. Porter from what had appeared to be an inexcusable misunderstanding of obvious interpretations of the facts dealt with in stratigraphical geology. The internal evidence points clearly to the conclusion that he had been led astray by reading "The New Geology," or some other of Price's publications.

And who can be surprised that one, to whom science is evidently a sealed book, should thus follow a blind leader! For does it not stand written in a pamphlet by Marion McH. Hull, M.Sc., M.D., entitled "Evolution, What it is and What it does," an address delivered at the summer Bible School, Atlanta, Georgia, that George McCready Price is a "present day scientist of the highest repute?" (For a geologist's opinion of Price's claim to be a geologist, see Professor Arthur Miller, SCIENCE, June 30, 1922.) Unlike the Rev. Mr. Porter, who, so far as I noted, quotes fairly, Dr. Hull, after the manner of anti-vivisection writers, is unmindful of the dates of the authorities whom he quotes. Thus it appears that he quotes no opinions adverse to the theory of evolution later than Sir William Dawson and Louis Agassiz. The latter died December 14, 1873 (fifty-three years and fifteen days ago). In the college year 1881–2 I had the privilege of listening to a series of lectures by Principal Dawson, delivered at the Divinity School of Yale. Professor Verrill advised a group of us, to whom he was lecturing, to attend these lectures as it would be, in all probability, our last opportunity to hear an eminent scientific man who still held to views concerning the processes of nature which had been abandoned, or greatly modified, by scientific investigators at that time.

The lecturer had little to say on theoretical matters. Most of his time was taken up by arguments to show that his *Eozoon canadense* was the fossil remains of a low form of life. It might be added that if he had succeeded in convincing his fellow-workers in paleontology that Eozoon is a fossil organism, and not a mechanical association of serpentine and calcite, the result would have had no other bearing on evolution theories than to push the proved existence of life an unnumbered millions of years back of any then known record.

In like manner, if one may be permitted to turn from the thoughts of great men of the past to the fancies of one who has not achieved greatness, McCann's Triassic fossil, which he figures in that rawhead and bloody-bones book, "God—or Gorilla," if correctly interpreted by him, would give to man an antiquity exceeding by many millions of years even Scheuchzer's *Homo diluvii testis* of the Upper Miocene.

One does not have to read far in "The New Geology" to find abundant justification for the observa-

tion of Professor Gregory, of Yale, on hindrances to progress in geological knowledge:

> The history of geology is essentially the history of the intelligent observation of rocks, fossils, and land forms. Progress is marked by progressive increase in exactness and completeness of observation. In an atmosphere saturated with tradition and personal bias the making of observations and interpretation of observations present but a sickly growth; and when the intellectual environment includes authority and a complete outfit of supernatural causes, growth is stopped entirely.[13]

Price, enveloped as he is in an atmosphere of authority which is saturated with supernatural possibilities, has undertaken the task of placing two ill-matched and flimsy patches on a perfectly good garment.

The first of these patches, designed to cover up evidence of an orderly appearance of organic forms throughout geological time, may be designated as his theory of contemporaneity. The second is his search for a stupendous world catastrophe which may be made to confirm the accounts of a universal deluge which are given in the book of Genesis.

The following extract from his account of life in the Ordovician illustrates his tailorship in the matter of contemporaneity of fossil forms:

> It is the first grand display of ocean life which we meet with in the fossiliferous series; but at the most it is only a partial display of *the total* marine life which may have existed contemporaneously, the fossils of which geologists may have assigned to the Jurassic, the Cretaceous, or the Tertiary system. What glimmer of a scientific reason is there for saying that these Ordovician forms of life occupied the oceans exclusively, and that examples of the higher forms of life, such as the teliost fishes, or the ammonites and the nummulites [here the reader expects the author to continue: "or the Hittites and the Perizzites"], or even the mammals, were not then in existence anywhere on earth.[14]

And the following, in which shreds of both patches appear:

> And how much stronger, how irresistible, is the evidence, when we remember that such forms as the dinosaurs and the ammonites, the semi-tropical florae of the Cretaceous and Carboniferous coal beds, with the trilobites and all their associated companions, can not be separated in time from this common catastrophe, which thus becomes literally and absolutely world wide in extent![15]

We may expect a chapter from Conan Doyle's delightful book, "A Lost World," to appear in a new edition of "The New Geology." It would add to the entertainment of the reader and would not in the least mar the symmetry of the author's contentions.

It will be a shock to members of Section F to read on page 584 that "Lake Onondaga . . . contains marine squids." Since real paleontologists have been victims of that fake, a stay of sentence may be granted with the understanding that this untruth be elided from subsequent editions.[16]

On pages 608–9 the author indulges in a rhetoric which will make pleasant reading to those who are unfamiliar with the facts with which geology has to do, but who are accustomed to the flamboyant language of orators who allow their feelings to lull to sleep their own and their auditors' common sense. He closes his rhapsody with one of the most beautiful passages in all literature: "And there shall be no more death, neither sorrow, nor crying, neither shall there be any more pain; for the former things have passed away." Those who have greatest reason for protesting against this prostitution of the grand apocalyptic vision of the Seer of Patmos, in order to embellish a theory of geological history which is grotesquely and demonstrably contrary to fact, are the persons to whose prejudices he is making his appeal.

The great catastrophe is accounted for on pages 684–5. After speaking of the inclination of the earth's axis to the plane of its orbit, he continues:

> But if we may suppose such a change possible—that is, if the earth's axis had been formerly perpendicular to the plane of its orbit, and some external force had changed the earth to its present inclined position, and changed it suddenly—there would be forces let loose on the earth's surface sufficient to do an inconceivable amount of geological work. . . . In the mean time the surface of the earth would be shattered and dislocated beyond all description; and twice each day the ocean would sweep a mighty tidal wave around the world, attaining a maximum; *every 150 days*, of about six miles in height at the equator (Twisden). Such translation wave traveling at the rate of 1,000 miles an hour at the equator, and proportionally in the other latitudes, would certainly leave no dry land anywhere on earth, and would seem to give us a wonderfully competent cause for the production of the geological changes. And it is at least a remarkable coincidence that a period of 150 days is twice mentioned in the Bible account of the Deluge.[17]

The author has here unloosed forces the result of whose action, contrasted with the world's experience in the days of Noah, are beyond comparison; a hurricane to a summer zephyr would be far from coming in the same class.

[13] "The Development of Sciences," p. 169.
[14] p. 370.
[15] p. 585.
[16] See Ortman, SCIENCE, Jan. 2, 1903, p. 30.
[17] Gen. 7: 24; 8: 3.

It is not, however, with the grand style that the author closes all his sonorous paragraphs. Sometimes he adopts a style which has been found very effective in proving to popular audiences that the reasoned conclusions of science are wrong. Thus:

> How can alleged "widespread" unconformity be used to supplement the historical succession of life? Can one lift one's self by the top of one's boots? Can a bobtail dog catch his tail by chasing it? p. 673.

My venerated teacher James D. Dana (whose remarks on the formation of coal beds Price calls naïve, p. 461) was a devout man. I am glad that he was spared such a trial to his habitual Christian forbearance as he would have been subjected to if "The New Geology" had been published thirty-five years ago.

Of course it is scarcely necessary to say that the book would be quite unworthy of notice if it did not represent itself as "A Text-book for Colleges, Normal Schools and Training Schools; and for the General Reader."

This exhibit of vapid argumentation, of shameless desecration of the temple of truth, of obscurantism masquerading in the lion's skin of science, is one aspect of the embattled forces of ignorance and superstition with which friends of the truth that is revealed in nature, as well as friends of the truth that maketh free, have at this late day to contend.

The imprimatur of the Princeton University Press gives to "The Dogma of Evolution," by Louis T. More, professor of physics, University of Cincinnati, a claim upon the reader's attention which the book itself fails to vindicate.

This book enjoys the singular distinction of having a place among recent books on evolution cited by *Science Service*, and also of being named in a list of "helpful" books, where it follows immediately McCann's "God—or Gorilla," kindly furnished me by the Bible Institute Colporterage Association of Chicago ("The Moody Press"). The letter-head on the sheet which contains this list of "helpful" literature carries also these words: "Best Evangelical Literature" and "Take the Gospel to the People."

This is an exasperating book to any one who is reasonably well informed on the literature of the biological sciences. It is likely to be equally exasperating to the Fundamentalist reader when he encounters such passages as:

> I shall not use the word miracle as descriptive of the legendary stories of early peoples or as indicative of the supernatural events used to strengthen the faith of the credulous; these for the most part are insignificant and puerile. p. 354.

The purpose of the book, as stated on page 34, "is not to discuss the validity of evolution (which he admits, and of which he gives a good definition on page 303) but rather to trace the effects of its application to the broader fields of social life and religion."

One wonders why, with such a purpose in mind, he finds it necessary to accuse Conklin of "confusing the clarity of his scientific reasoning," p. 24; to impute disingenuous practices to Huxley (p. 110); and jealousy of rivals to Darwin (p. 183); to sneer at the cytological work of E. B. Wilson (p. 288), etc., etc.; and, as a sin of omission, to neglect to inform himself of the work, even of his own countrymen, such as Castle, Davenport and Morgan, in genetics, the outstanding contributions of biology to science in the present century.

The demand of the author that biologists, before such a theory as evolution may be established, should be able to predict the course of events in a living organism with the same certainty as the physicist and the astronomer can do, is sufficiently answered by the remark of J. Arthur Thomson[18] that while it is possible to calculate the movements of a comet, and to predict its appearance at a certain time and place, no one can with certainty predict in what direction a cat will jump next.

The reader discovers before going far that the author thinks that he is a follower of Lamarck. This interesting fact may account for the puzzling exception in favor of the Lamarckian theory already cited. And how simple the process of reasoning by which such a conclusion is reached. Thus, Professor More, along with McCann, is recommended to us as an author who will be "helpful" to us in our fight against Darwinism. Lamarck's theory is anti-Darwin. Professor More accepts the Lamarck theory. Therefore, down with Darwin, great is the theory of the inheritance of acquired characters!

Time does not permit of a discussion of such items as the author's misunderstanding of Bateson (pp. 158–9); his amazing remarks on the origin of feathers (p. 156); and his occasional lapses from his usually chaste diction into what may be termed a Bryanesque floridity. Thus:

> The biologists rejoice to mortify us by saying that we are but an aggregation of cells and so is the amoeba; then they show us by the microscope that our cells and the amoeba's cells are just alike (p. 243).

If the timorous defenders of authority at Baylor, Denison and Mercer Universities, and at the Universities of Mississippi and Tennessee found the professors, whom they recently dismissed, guilty of showing Professor More, or any one else, an amoeba with

[18] "Science and Religion," p. 6.

cells just like his, they were amply justified in their several summary procedures.

The thought should not be entertained by any one that Professor More's criticism of present-day biologists and their works is resented because the criticism is made by a physicist. Criticism of scientific conclusions is the high privilege of any one who chooses to make it, and none are more given to criticize biological theories than biologists themselves. But the critic can not be granted immunity from criticism of his own criticisms of others. Professor More, therefore, will not, it is to be hoped, take it amiss, when it is suggested that he ponder his own words of wisdom, what time, in reference to the remarks of Linnaeus on Mt. Ararat, being fitted to serve as a temporary refuge for diverse animals, tropical at its base, and suitable for the polar bear at top, he says:

> This anecdote is not given to sneer at the frailty of a great man but rather to show that profundity in a special field of work is very frequently accompanied by naïveté when the subject is a little foreign to one's specialty (p. 131).

REACTION OF THE LEGAL MIND TO SCIENTIFIC CONCLUSIONS

The line of cleavage which separates those who reach reasoned conclusions by way of the scientific method from those who rely upon authority to which they attribute infallibility runs through the legal as well as through the theological fraternity.

The two divisions into which those learned in the law fall are typified by Judge Raulston, brought to public attention in the recent trial at Dayton, Tennessee, who represents the traditional, authoritarian or Fundamentalist point of view. The other finds its prototype in Ex-Secretary Hughes.

Judge Raulston, in an address which he delivered in Calvary Baptist Church, is reported in the New York *Times* for November 9, 1925, as saying:

> If I listen to evolution and lose my faith in Genesis I am afraid I'll lose my faith in the rest of the Bible; and if I want to commit a larceny I'll say I don't believe in that part of the Bible that says: "Thou shalt not steal."

If the judge really feels that way about his ethical foundations his neighbors should see to it that all reputable literature which deals with scientific conclusions, including those of the best Biblical critics, be kept away from him, else they may find it necessary to put extra padlocks on their smokehouses.

In spite of what the judge says of himself I am not inclined to doubt either his goodness or his sincerity. If he is also wise, and really desirous of knowing what the scholarship of his church has to say on the subjects of evolution and Biblical criticism, it may be worth while to suggest that he make a trip to Chicago, and there consult Dr. Shailer Mathews, who, if I am not in error, is of the same communion as he. After sitting at the feet of that eminent scholar and teacher he may come to some realization of the immense harm he is doing to the cause which he is so zealous to promote, by such utterances as those given in the report of his New York address, the worst parts of which I refrain from quoting.

And now, emerging from the medieval gloom which still broods over a portion of the bar, turn to the light, listen to the words of Ex-Secretary Hughes and take courage.

To show that he has an intelligent appreciation of the value of the scientific method I quote briefly from an address which he delivered before the American Association for the Advancement of Science at its meeting in Washington a year ago:

> If to an increasing degree we have the security of sound public opinion, if the extravagance and diatribes of political appeals fail of their object, and if notwithstanding the apparent confusion and welter of our life, we are able to find a steadiness of purpose and a quiet, dominating intelligence, it is largely because of the multitude of our people who have been trained to a considerable extent in scientific method, who look for facts, who have cultivated the habit of inquiry, and in a thousand callings face the test of definite investigations. With scientific applications on every hand the American people are daily winning their escape from the danger of being fooled. There are, it is true, many false prophets who are active in those areas of exertion where patient inquiry and regard for facts are not much prized, but their following, while strident, is apparently not increasing.
>
> We need your method in government: we need it in law making and in law administering. We need your interest in knowledge for its own sake; . . . your ceaseless search for the truth; your distrust of phrases and catch-words; your rejection of every plausible counterfeit; your willingness to discard every unproved theory, however honored by tradition; . . . and above all your faith in humanity and your zeal to promote social welfare.

THE OUTLOOK

To many, as they see the rising tide of ignorance which is manifesting itself in reactionary legislation designed to mould the modern mind after the pattern of an age unlearned in the interpretation of nature, the situation appears to be serious. To some this disposition to exalt traditional authority over the demonstrated truths of science portends another dark age for civilization. I do not so read the signs. As I recall the reactions of science to theology fifty years ago, they were for the most part either attempts to reconcile the established truths of science with the record in the book of Genesis, or expressions of in-

difference, tinged perhaps with contempt for that ancient record. Meanwhile, theological opponents to science were either retiring defeated from the field of debate, or were taking up the task of adjusting their systems of philosophy to the new knowledge.

In contrast with the intellectual combats of a half century ago the present is characterized by a rapprochement between informed theologians and leaders in scientific investigation which is marked by a growing mutual understanding and respect. As a warrant for this statement it is necessary to refer only to such an organization as the American Institute of Sacred Literature of Chicago under the leadership of Professor Shailer Mathews, and the cooperation of such well-known scientific men as E. G. Conklin, Robert A. Millikan, Edwin B. Frost, Henry Fairfield Osborn, and others. A correspondent puts it this way:

> It seems to me that one can hardly say that there has been a recrudescence of medievalism; there has rather been an awakening on the part of some of the traditionalists to the rapid spread of a real interest in religion among men of scientific spirit. These men have the scientific habit, and they carry it with them into fields that such men would hardly have chosen for their specialty in former generations.[19]

Whether that be a correct diagnosis of the situation or not, I think that between the intellectual leaders in the physical sciences and in theology there is a growing disposition to work, each in his own field, without fear and without distrust, each desirous to press outwards, as far as may be, the boundaries of the known.

As for the active enemies of science, they may be dismissed as portents of evil with the Psalmist's words: "Why do the nations rage (marginal reading, "tumultuously assemble"), and the peoples imagine (marginal reading, "meditate") a vain thing?" The hope may still be entertained that, in spite of their emotional hostility to knowledge, their bondage to superstition, and their fear of the truth, they may yet adopt the scientific method of investigation suggested by Philip to Nathanael, and "come and see."

EDWIN LINTON

MEDICAL DEPARTMENT,
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ELLSWORTH BETHEL

ELLSWORTH BETHEL was born at Smyrna, Ohio, in 1863. In 1890 he became instructor in biology in the East Side High School, Denver, a position which he held until 1917. During this long period he enthusiastically studied the plant and animal life of Colorado, paying special attention to those obscure and difficult groups, such as the fungi and slime molds, which had been little investigated in the West. Many hundreds of pupils passed through his hands, and to the great majority he was able to communicate a fair measure of his own interest in nature. Some eventually became competent investigators, and all spoke of him with affection and respect. As a collector, Bethel was extraordinarily active, by no means confining himself to those groups which he personally studied. He was continually calling attention to facts and problems in such fields as entomology and conchology, in which he did not pretend to be an expert. The great accumulations of plants, especially fungi, in the State Museum at Denver, ran far ahead of the possibility of critical study with the available resources. It was always Bethel's hope that he would be able, in his later years, to thoroughly revise many of these materials. Unfortunately, the state of Colorado could not appreciate the importance of work on the native fauna and flora, and in the absence of financial support progress was difficult. Thus Bethel was led to take up work on economic mycology with the U. S. Department of Agriculture, and in this field has left a distinguished record.

Bethel's scientific discoveries were numerous. In the grand canyon of the Colorado, close to the trail where hundreds of tourists pass every year, his keen eyes detected a peculiar snail, which proved entirely new to science, and was named after him by Professor Junius Henderson. In California, one April day in 1923, Bethel picked a mariposa lily, and noticed an unusual looking bee in the flower. It turned out to be a new genus, which received the name *Betheliella*. Among the insects, those forming galls came in for special attention, and many new species were discovered. There are very few whose natural history interests are so wide, and fewer still who have the sort of intuition which leads them to collect unknown or little known species in groups they do not personally study. In these respects Bethel combined the qualities of a naturalist of the old school with aptitudes more characteristic of modern times. He was a pioneer in the West, and although cut short in his prime, and variously handicapped during his life, he has left a name which will not be forgotten.

Dr. Haven Metcalf, Bethel's chief in Washington, sends me the following statement, with permission to quote:

> In 1917 Bethel was appointed to the office of Forest Pathology as an associate pathologist. At the time we were in confusion over the question whether the white pine blister rust was or was not a native of America. A rust had been collected in Kansas many years ago, which

[19] Hon. Henry W. Temple, M.C.

was passing in the literature as blister rust. Suspicion pointed to the probability that this was a rust having its alternate stage on some pine other than a white pine, and Betnel was the only man to whom we could turn for help on this particularly complicated matter. His work played the dominant part in leading to the demonstration that the western rust was a new species, *Cronartium occidentale,* with its alternate stage on piñon pine, thus disposing of the fear that the white pine blister rust might be native. Upon this conclusion rests the value of the whole campaign against the white pine blister rust. Bethel's knowledge of the rusts of the Rocky Mountain region, or indeed of the whole West, was prodigious. He was the best collector that I ever saw in action. . . . He is profoundly missed by a large group of coworkers and correspondents. There is no one to take up his work.

Other botanists express themselves in similar terms, all emphasizing Bethel's tremendous industry and enthusiasm, and readiness to assist others working in the same field. Ellsworth Bethel died suddenly at Denver, Colorado, September 8, 1925.

T. D. A. COCKERELL
THE UNIVERSITY OF COLORADO

SCIENTIFIC EVENTS

THE FOURTEENTH INTERNATIONAL GEOLOGICAL CONGRESS

THE second circular of announcements covering the Fourteenth International Geological Congress to be held in Spain is of interest to all geologists, but is of special importance to all those who contemplate attending the meeting.

The formal scientific and business meetings of the Congress will be held in Madrid, from May 24 to May 31, 1926.

Consistent with the traditional democracy of previous geological congresses, membership requires no professional title nor credentials, but participation in the excursions is reserved to official delegates of the different nations, geologists, geographers, mining engineers, and all persons engaged in the study or application of any branch of geology. The membership fee is 30 pesetas, which covers admission to the sessions and receipt of the memoirs of the congress. The present exchange value of the peseta is 14.12 cents.

Following the custom established at a number of preceding congresses, the coming session will be marked by the presentation and issue of an outstanding monograph relating to some important mineral commodity or commodities, which for this congress will cover the world's resources in phosphates and pyrites. American geologists will recall the invaluable report on the coal resources of the world similarly issued by the Twelfth International Congress, which met in Toronto in 1913.

Additional topics which will be made the subject of special discussion at Madrid include: (A) "Geology of the Mediterranean"; (B) "Cambrian and Silurian Faunas"; (C) "Geology of Africa and its Relation to that of Europe"; (D) "Tertiary Invertebrates"; (E) "Hercynian Folds"; (F) "Tertiary Foraminifera"; (G) "Modern Theory of Metallogeny"; (H) "Vulcanism"; and (I) "Geophysical Studies, their Application to Geology and the Necessity of Unification of Gravimetric Methods."

Contributions may be made in English, French, German or Spanish, and abstracts or summaries, which in length should not exceed one page of printed text, should be submitted to the general secretary on or before April 1. Final manuscripts should be sent typewritten in duplicate and in corrected copy.

The excursions planned to cover the principal geologic provinces, mining centers, types of resources and special geologic features are of exceptional interest from many points of view and reflect the pains taken by the Spanish government to make this congress most enjoyable as well as successful. Most of them will take place in advance of the congress, a few short ones during the congress and several longer ones after the congress. The earliest begins on May 5. Though mainly geologic in purpose, matters of scenic and historical interest are also included. Following is a mere list of these excursions, the various and attractive objectives, the itineraries and other details of which are given in the "second circular":

A–1. Gibraltar, Seville, Algeciras and northern part of Morocco, covering iron deposits of Melilla, the Tertiary of the lower Guadalquivir, Tetuan, the Mount Uixan ore deposits, and other points of special interest; 12 days, starting May 10; 575 pesetas.

A–2. Structure and petrography of the Mountains of Ronda, via Melaga, the metamorphic area of "Los Llanos del Jaunar," and Seville; 6 days, starting May 14; 400 pesetas.

A–3. Mining regions of Linares and Nuelva, the richest lead and copper districts of Europe, including the famous Rio Tinto mines; 10 days, starting May 13; 415 pesetas.

A–4. Tectonic study of the Guadalquivir valley and petrology and paleontology of the Cordova Mountains; 7 days, starting May 16; 315 pesetas.

A–5. Tectonics, stratigraphy and paleontology of the Andalusian Mountains from the border of the Iberian Plateau to the Sierra Nevada, an excursion of notable paleontologic, historic and artistic importance, including Granada and the Alhambra; 12 days, starting May 11; 570 pesetas.

A–6. The Continental Tertiary of the vicinity of Burgos; 2 days, starting May 20; 160 pesetas.

A–7. Review of the volcanic, petrologic, historical and scenic features of the Canary Islands; via Seville, Cadiz and South American steamer; 17 days, starting May 5; 800 pesetas.

B–1. Mercury mines of Almaden; 1 day, starting May 26; 15 pesetas.

B–2. Orogenic, petrologic and glacial features of the Gaudarrama Mountains; 1 day (not fixed); 40 pesetas.

B–3. Motor car excursion for examination of the Continental Tertiary and Castilian Steppes of the River Tajo basin, with visit to the royal palaces and gardens at Aranjuez; 1 day; 50 pesetas.

The excursions following the congress include:

C–1. Paleozoic series and coal mining of the Asturias district, with examination of manganese mines at Covadonga and inspection of noted tectonic, scenic and historical features en route; 6 days, starting June 1; 275 pesetas.

C–2. Iron deposites of Bilbao, especially for mining engineers; 3 days, following the Asturias excursion and starting June 8; 200 pesetas.

C–3. Potash-bearing basin of Catalonia and the central Pyrenean Mountains via Barcelona, Monserrat, Manresa, Solsona, Artesa, Isona and other points of varied geologic and historic, scenic or industrial significance; 11 days, starting June 1; 475 pesetas.

C–4. Potash basin of Catalonia and the eastern Pyrenees, with especial attention to the Cretaceous formations and the volcanic system of Olot. This excursion, which overlaps the preceding, covers the lignitic basin of Figols, the review of various Carboniferous, Triassic and Cretaceous sections, tectonic features connected with the Mediterranean region, the volcano of Lacot, and the mud volcanoes and sulphur springs in the vicinity of Castellfullit and Bañolos; 10 days, starting June 6; 400 pesetas.

C–5. The tectonics, the Triassic and Tertiary stratigraphy and paleontology, the grottoes, caves, coal mines, etc., of the Balearic Islands; 11 days, starting June 4, but overlapping on excursions C-3 and C-4 for the first three days; 430 pesetas.

It is important to note that (A) only members of the congress may participate in excursions; (B) the number of participants in each excursion is limited, on which account early applications are necessary for the completion of arrangements; (C) applications for participation in excursions preceding the congress must be in the secretary's hands on or before the first of April; (D) period of admission to excursions taking place during the congress (group B) and after the congress (group C) expires May 1; (E) the excursion fee includes the guidebook for that excursion, and all expenses, including voyages, hotel, meals, tips, etc., of the ordinary character. Excursion reservations are payable in advance.

Further information, particulars and conditions will be found in the "second circular," which is soon to be followed by a third circular covering such matters as hotels and guidebooks. All correspondence should be addressed to The Secretary of the Fourteenth Geological Congress, Instituto Geologico, Plaza de los Mostenses, 2, Madrid, Spain.

EXHIBITION OF MEDICAL EDUCATION AT CINCINNATI

UNDER the auspices of the Public Health Federation of Cincinnati and with the cooperation of the Cincinnati Academy of Medicine, the College of Medicine of the University of Cincinnati has prepared a free public exhibition of its activities, to be held during the third week in February. The exhibition is being held at the College of Medicine and is open afternoons and evenings from February 16 to 22, inclusive. It consists of static exhibitions from the various departments, of daily sessions of short educational talks on medical topics and of moving-picture shows illustrating the various phases through which a student of medicine must pass before he can accumulate enough knowledge to be fitted for the practice of his profession. The text of the exhibition is "The Physician in the Making"; the slogan: "What Medical Science means to You."

It is hoped that the public may thus be convinced of the indissoluble relationship of science and medicine; of the fact that brief courses of so-called instruction and a smattering of fallacious theory are a totally inadequate basis for an understanding of the ills that beset mankind, and that the sincerity of the medical profession may be made manifest by inviting "the man in the street" to come into a medical school and see for himself what the sciences have done and must do in order to cope with disease. The proposed exhibition is meeting with the wholehearted support of the lay press and health associations and it is hoped if it turns out successfully that medical schools in other cities will repeat this experiment.

The committees in charge of the exhibit consist of:

For the College of Medicine: Dr. N. Chandler Foot, Dr. Graeme Mitchell, Dr. Dennis E. Jackson and Dr. Edward F. Malone.

For the Academy of Medicine: Dr. Otto J. Seibert, Dr. Arthur Knight, Dr. Sam Zielonka and Dr. Charles E. Kiely.

For the Public Health Federation: Dr. T. A. Ratliff, Dr. Otto P. Geier, Dr. Elizabeth Campbell, Dr. Julien E. Benjamin, Dr. Wm. S. Keller and Mr. Bleecker Marquette.

LEGISLATION AGAINST THE TEACHING OF EVOLUTION

ON January 18, Representative Grover Cleveland Johnson, of Hardin County, introduced into the Kentucky House of Representatives House Bill 96, as follows:

An act prohibiting the teaching of the evolution theory in all the universities, normals and all public schools of Kentucky, which are supported in whole or in part by the public school funds of the state, and to prohibit the hiring of such teachers and provide penalties for the violations thereof.

SECTION 1.—Be it enacted by the General Assembly of the Commonwealth of Kentucky that it shall be unlawful for any teacher in any of the universities, normals and all other public schools of the state which are supported in whole or in part by the public school funds of the state to teach any theory that denies the story of the divine creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of animal.

SECTION 2.—Be it further enacted that any teacher found guilty of a violation of this act shall be found guilty of a misdemeanor and upon conviction shall be fined not less than $100 or more than $500 for each offense.

SECTION 3.—Be it further enacted that any person or persons hiring any teacher, knowing that said teacher hired is intending to teach any theory that denies the story of the divine creation of man as taught in the Bible shall be found guilty of a misdemeanor and upon conviction shall be fined not less than $100 or more than $500 for each offense.

According to the daily press the indications are that this bill will not be passed by the legislature.

The Mississippi House of Representatives passed on February 8, by a vote of 76 to 32, a bill to prevent teaching in state-supported schools the theory that man descended from a lower order of animals. The senate has not yet voted on the bill.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

THE American Institute of Electrical Engineers held its mid-winter meeting last week in the Engineering Societies Building, New York, with a total registration of about 1,500. President M. I. Pupin called the convention to order on Monday. He spoke briefly, dwelling on the tendency of technical and scientific men, whatever their specialty, to draw closer together.

On Monday afternoon a transmission session, with five papers, was held, and on Monday evening there were three papers on dielectrics and insulation, contributed, respectively, by Professors J. B. Whitehead, of the Johns Hopkins University; V. Karapetoff, of Cornell University, and C. L. Dawes (assisted by P. L. Hoover), of Harvard University. Tuesday morning the program included six papers on protection, control and bus construction, parallel sessions in the afternoon covering electrical machinery (four papers) and communication and sound reproduction (four). The paper by W. G. Baker and C. W. Rice, of the General Electric Company, on "Refraction of Short Radio Waves in the Upper Atmosphere" was an outstanding feature of Tuesday's proceedings. Another series of four papers on electrical machinery occupied Wednesday morning, the afternoon being given over to trips of inspection and the annual dinner-dance at the Hotel Astor occupying the evening. Electromagnetism and electrophysics supplied the topics for Thursday morning's four papers, and five papers on measurements (machinery and industrial) in the afternoon closed the technical program.

There was the "smoker" on Tuesday evening. On Thursday evening the program embraced a public meeting in the auditorium, with illustrated lectures by Dr. Alexis Carrel, member of the Rockefeller Institute for Medical Research, on "Some Modern Developments of Biological Research," and by Major Allen Carpe, of the American Alpine Club, on "The Ascent of Mount Logan."

THE SOUTHWESTERN DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE seventh annual meeting was held at Phoenix, Arizona, on February 15, 16, 17 and 18. The tentative program was as follows:

Monday, February 15, 1926.

9:00–10:00 A. M.—Registration.
10:00—Opening Session.
Invocation, The Reverend H. A. Ingham.
Address of Welcome, The Honorable G. W. P. Hunt, Governor.
Response, Dr. T. D. A. Cockerell.
Address: "Science Progress in 1925," Professor Ernest Anderson.
12:00—Luncheon.
Symposium: Topic, "Important Movements in Research," Dr. D. T. MacDougal, *chairman.*
2:00—Section Meetings.
3:30—Excursion to Tempe Date Farm.
8:00—General Session:
President's Address, "The Duty of Biology," Dr. T. D. A. Cockerell.

Tuesday, February 16, 1926.

9:30–11:30—Section Meetings.
12:00—Luncheon.
Symposium: Topic, "Present Status of American Arts Colleges," Dr. F. C. Lockwood, *chairman.*
2:00–4:00—General Sessions:
Symposium: "The Future of the Natural Resources of the Southwest."
4:00—Excursion to Papago Saguaro National Park.
"The Flora," Dr. Forrest Shreve.
"The Fauna," Dr. Charles T. Vorhies.
6:30—Informal Dinner, Hotel Adams.
8:00—General Session:
A lecture on astronomy, delivered by Professor Moulton, in Chicago, transmitted by long distance telephone, as arranged by Dr. Pupin, retiring president of the American Association.
Illustrated Address, "Student Life at Oxford," by Dr. Frank C. Lockwood.

9:30–11:30—Section Meetings.
(Sections select chairmen for next meeting at this session.)
12:00—Luncheon.
Symposium: Topic, "Interpretation of Unwritten History," Dr. Edgar L. Hewett, *chairman.*
2:00—Group Photograph.
2:00–4:00—General Session:
"Cuicuilco and the Archaic Culture of Mexico" (illustrated), Dr. Byron Cummings.
"Roman Jews in 'Terra Calalus' America from 775 to 900 A. D.," Professor C. L. Sarle.
4:00—Special entertainment for the visiting ladies.
6:30—Dinner, Medical Section, Country Club.
8:00—General Session:
Symposium: "Colorado River"—Sub-topics: Watershed, Cañon, Delta, Utilization of Colorado River.

Thursday, February 18, 1926.

9:00–10:30—Section Meetings.
(Excepting Education, which meets only three days.)
10:30–12:00—Business Meeting.
12:00—Luncheon.
Symposium: Topic, "Radiation," Dr. O. C. Lester, *chairman.*
2:00—General Session:
Symposium on general subject of Radiation.

Friday, February 19, 1926.

All day Archeological Excursion, conducted by Dr. O. A. Turney.

There was an exhibit of archeological, biological, chemical and other material open 9 a. m. to 5 p. m. daily. An unusual amount of very interesting material was included.

SCIENTIFIC NOTES AND NEWS

THE council of the Geological Society has made the following awards: Wollaston Medal to Dr. Henry Fairfield Osborn, of the American Museum of Natural History; Murchison Medal to Dr. William S. Boulton, professor of geology in the University of Birmingham; Lyell Medal to Dr. O. T. Jones, professor of geology in the University of Manchester; Wollaston Fund to A. L. Leach; Murchison Fund to W. S. Bisat; Lyell Fund to F. Raw and A. F. Hallimond.

THE faculty of medicine of the University of Toronto has awarded the Charles Mickle Fellowship for 1924 to Dr. August Krogh, professor of animal physiology in the University of Copenhagen, "on account of the far-reaching conclusions with regard to capillary circulation and the oxygen supply of the tissues which have been the outcome of his researches during the last ten years." The value of the prize is about $1,300; previous awards have been made to Sir James Mackenzie, Dr. Frederick G. Banting, Dr. Harvey Cushing and Professor I. P. Pawlow.

DR. ROSS G. HARRISON, professor of comparative anatomy at Yale University, will give four lectures under the Edward K. Dunham lectureship at the Harvard Medical School on February 24, 26, March 1 and March 3 at five o'clock. The subject of Dr. Harrison's lectures will be "Recent Advances in Experimental Embryology."

DR. HERBERT E. IVES, of the Bell Telephone Laboratories, past president of the Optical Society of America, has been elected a foreign fellow of the Optical Society of London.

THE Collier trophy, awarded annually by the National Aeronautic Association for the greatest achievement in aviation in the United States, has been presented to Dr. S. Albert Reed, of New York, for development of the high-speed Reed metal propeller.

THE Rivers Memorial Medal for anthropological work in the field for 1925 has been awarded by the council of the Royal Anthropological Institute to Professor C. G. Seligman for work in New Guinea, Ceylon and the Sudan.

COLONEL R. B. CRUMPTON, English electrical engineer, has been awarded the Faraday Medal of the Institution of Electrical Engineers.

LIEUTENANT-COLONEL E. GOLD, assistant director of the Meteorological Office, England, was presented with the Symons gold medal of the Royal Meteorological Society at its annual meeting on January 20.

PROFESSOR PAUL SABATIER, professor of chemistry in the University of Toulouse, and Professor E. L. Bouvier, professor of zoology (entomology) in the National Museum of Natural History, Paris, have been elected associates of the division of sciences of the Royal Academy of Sciences, Letters and Art, of Belgium; Professor Marc de Sélys Longchamps, of the University of Brussels, has been elected a corresponding member of the academy.

DR. JOHANN POHLIG, professor of geology and paleontology at the University of Bonn, recently celebrated his seventy-fifth birthday.

PROFESSOR OTTO DIELS, head of the department of chemistry at the University of Kiel, celebrated his fiftieth birthday on January 23.

PROFESSOR HARRIS J. RYAN, of Stanford University, was recently honored by the establishment of the Harris J. Ryan laboratory at the university, which is being financed and equipped by a number of electric and power companies. It is hoped ultimately to spend from $400,000 to $500,000 on the laboratory.

AT a conference of representatives of all civic organizations in Nashville, in accordance with an annual custom, Dr. William D. Haggard, president of the American Medical Association, was selected as Nashville's leading citizen for 1925. Dr. Haggard was awarded the Kiwanis loving cup, said to be the highest civic honor his community bestows.

DR. HERMAN G. WEISKOTTEN, acting dean and professor of pathology at Syracuse University College of Medicine, has been appointed commissioner of health of Syracuse in succession to Dr. Thomas P. Farmer.

DR. ISIDORE S. FALK, assistant professor of hygiene and bacteriology at the University of Chicago, has been appointed director of surveys of the Chicago Health Department and will undertake a series of statistical studies.

HAROLD PEAKE has been elected president of the Royal Anthropological Institute of Great Britain and Ireland.

AT the annual meeting of the Royal Microscopical Society held on January 20 Dr. James A. Murray was elected president.

DIAMOND JENNESS has been appointed chief of the division of anthropology of the National Museum, Department of Mines, Ottawa, Canada, to fill the vacancy created by the recent resignation of Dr. Edward Sapir. In addition to the administrative duties of this position, Mr. Jenness will continue the anthropological investigations of the Arctic and Sub-Arctic Eskimos, on which he has been actively engaged since 1913.

DR. RUDOLF RUEDEMANN, of the New York State Museum, has been appointed state paleontologist by the regents of the University of the State of New York.

DR. ALLEN E. STEARN, assistant professor of physical chemistry at the University of Missouri, has been granted an extension of his leave of absence and will continue his research work with Professor A. A. Noyes at the California Institute of Technology.

PROFESSOR WINTHROP C. WRIGHT, head of the department of physics at Swarthmore College, is spending his sabbatical year working in the Cavendish laboratory at the University of Cambridge.

DR. C. K. LEITH, professor of geology at the University of Wisconsin, has been granted a leave of absence by the university and sailed for England on February 13. On March 2 Dr. Leith will address the British Institute of International Affairs on "Mineral Resources in their International Aspects."

DR. ROBERT CHAMBERS, professor of microscopic anatomy at the Cornell University Medical College, returned on January 26 from a lecture tour of the middle west under the auspices of the Mayo Foundation and affiliated scientific organizations. Lectures on "The Physical Properties of Protoplasm" were given at the Mayo Foundation, the University of Minnesota, the Des Moines Academy of Medicine, the University of Iowa, Washington University and at a meeting of the Indianapolis section of the American Chemical Society at the Eli Lilly Company. Dr. Chambers was accompanied by Dr. Paul Reznikoff, instructor of medicine at the Cornell University Medical College, who gave demonstrations of the procedures of micromanipulation on the amoeba.

DR. CHARLES P. BERKEY, professor of geology in Columbia University, gave the annual Darwin lecture at New York University on February 12 on "The Significance of Recent Discoveries in Central Asia."

FREDERICK H. NEWELL, of Washington, D. C., consulting engineer for the United States Reclamation Service, will give the Chester S. Lyman lectures on "Water Conservation" at Yale University on February 17, 18, 22 and 23.

DR. ANTON J. CARLSON, chairman of the department of physiology, University of Chicago, delivered the William Beaumont lectures before the Wayne County Medical Society on January 25 and 26 on "Studies on the Physiology of the Alimentary Tract."

PROFESSOR THEODORE LYMAN, director of the Jefferson Physical Laboratory at Harvard University, gave a lecture before the Franklin Institute, Philadelphia, on February 17 on "Radiations."

DR. VERNON KELLOGG, retiring president of the Washington Academy of Sciences, addressed the 205th meeting of the academy on February 18 on "Some Things Science doesn't know."

PROFESSOR MALCOLM MACLAREN, chairman of the department of electrical engineering in Princeton University, will give a lecture before the Franklin Institute on February 28, on "Interpole Motor in Theory and Practice."

DR. L. H. BAILEY, president of the American Association for the Advancement of Science, spoke on February 4, on the occasion of the dedication of the new horticultural building at the Michigan State College at East Lansing. This structure succeeds the building of 1888, built during Dr. Bailey's professorship at the institution which was then it is said the first distinctively horticultural laboratory to be erected in this country.

ON January 30, Dr. Andrew Hunter, of the de-

partment of biochemistry in the University of Toronto, delivered an address to the Royal Canadian Institute on the subject "Vitamins or Accessory Factors in Diet." On February 6, Professor Guilford B. Reed, of the department of bacteriology at Queen's University, Kingston, delivered an address before the institute on "Light and Life's Processes."

PROFESSOR KNUD FABER, of the University of Copenhagen, will give an address before the congress of Internal Medicine which meets in Detroit and Ann Arbor from February 22 to 27.

M. HENRI CORREVON, founder and director of the Jardin Botanique de la Linnea at Geneva, Switzerland, will speak under the auspices of the Smithsonian Institution on February 20, in the lecture hall of the National Museum.

THE executive committee of the Lister Memorial Fund has announced that Sir Charles S. Sherrington, professor of physiology in Oxford University, will be the second Listerian orator at the annual meeting in 1927.

PROFESSOR A. V. HILL began a course of six lectures on the physiology of muscle at University College, London, on Monday, February 1, at 4 p. m. They are being continued on succeeding Mondays at the same time.

DR. C. LEVADITI, of the Pasteur Institute, Paris, gave an address on "Recent Advances in the Chemotherapy of Syphilis" at the dermatological section of the Royal Society of Medicine on January 21.

THE Howe memorial lecture, given annually under the auspices of the Iron and Steel Committee of the American Institute of Mining and Metallurgical Engineers in honor of the late Professor Henry M. Howe, of Columbia University, will be delivered during the meeting of the society in New York City from February 15 to 18 by Professor William Campbell, of that university, the subject being "Twenty-five Years in Metallurgy."

DR. HARVEY CUSHING, Moseley professor of surgery at the Harvard Medical School, made the presentation address at the unveiling of a portrait of Edward Revere Osler, which Lady Osler has given to the Tudor and Stuart Club of the Johns Hopkins University.

A MEMORIAL meeting for Dr. Samuel Taylor Darling, who was killed in an automobile accident, May 20, 1925, near Beirut, Syria, while on duty as a member of the League of Nations Malarial Commission, was held on January 17 at the School of Hygiene and Public Health, the Johns Hopkins University. Dr. William H. Welch presided. Addresses were made by Dr. Edgar B. Friedenwald, Dr. Frederick F. Russell, Dr. Wilson G. Smillie and Dr. Robert W. Hegner.

CHARLES VANCOUVER PIPER, for twenty-two years agrostologist of the department of agriculture and previously professor at the Washington State College, died at Washington on February 11, aged fifty-eight years.

DR. THOMAS BUCK HINE, chemist, known for his development of the aerial smoke screen for war purposes, died on February 9, aged thirty-eight years.

GEORGE M. BOWERS, commissioner of fisheries from 1898 to 1913, died on December 7.

DR. JAMES FAIRLIE GEMMILL, professor of natural history in the University of Saint Andrews, Scotland, died on February 10 from accidental drowning.

THE REVEREND GEORGE HENSLOW, lately professor of botany to the Royal Horticultural Society and from 1882 until 1904 president of the Ealing Natural History Society, died on December 30, aged ninety years.

PROFESSOR SIEGFRIED BECHER, head of the department of zoology and comparative anatomy at the University of Breslau, recently died at the age of forty-one years.

DR. ADOLPH HEYDWEILLER, emeritus professor of physics at the University of Rostock, has died at the age of sixty-nine years.

DR. IWAJI IKEDA, professor of zoology in the Kyoto Imperial University, Japan, recently died at the age of fifty-three years.

THE United States Civil Service Commission announces open competitive examinations as follows, receipt of applications for which close on the dates given: Assistant geologist at a salary of $2,400, March 16; junior geologist at a salary of $1,860, March 12; organic chemist and a physical chemist at entrance salaries of $3,800, February 23; associate metallurgist at a salary of $3,000, March 2; assistant metallurgist at a salary of $2,400, March 2; associate engineer at a salary of $3,000, April 30; assistant engineer at a salary of $2,400, April 30.

AT the annual meeting of Engineering Foundation on February 11 the following officers were elected for the ensuing year: *Chairman,* Lewis B. Stillwell, American Institute of Electrical Engineers; *vice-chairmen,* Elmer A. Sperry, American Institute of Electrical Engineers; George A. Orrok, American Society of Mechanical Engineers; *additional members of the executive committee,* J. Vipond Davies, American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers; Professor A. M. Greene, Jr., American Society of Mechanical Engi-

neers; *director and secretary,* Alfred D. Flinn; *treasurer,* Jacob S. Langthorn; *assistant treasurer,* Henry A. Lardner.

AT the annual meeting of the board of trustees of the United Engineering Society, on January 28, the following officers were elected for the ensuing year: *President,* W. L. Saunders; *first vice-president,* Bancroft Gherardi; *second vice-president,* Lewis D. Rights; *secretary,* Alfred D. Flinn; *treasurer,* Jacob S. Langthorn; *assistant treasurer,* Henry A. Lardner.

AT the meeting of the councilors of the Northeastern Bird Banding Association, held on January 21, at Boston, Mass., the following officers were elected for the ensuing year: *President,* Francis H. Allen, Boston; *vice-presidents,* Francis Beach White, Concord, N. H.; Henry S. Shaw, Waban; Harrison F. Lewis, Toronto, Canada; Charles L. Whittle, Cohasset; *corresponding secretary,* Laurence B. Fletcher, Brookline; *recording secretary,* Mrs. Alice B. Harrington, Cambridge; *treasurer,* Charles B. Floyd, Auburndale. S. Prentiss Baldwin, of Cleveland, Ohio, was made honorary president of the association.

UNIVERSITY AND EDUCATIONAL NOTES

GIFTS for scientific, educational and humanitarian work totaling $1,339,000 were made by the Commonwealth Fund during the fiscal year ending September 30, 1925, according to the seventh annual report. The endowment of the fund, which was established in 1918 by gift of Mrs. Stephen V. Harkness, was $27,761,000 at the end of the year reviewed in the report, but recent donations from Mrs. Harkness have increased that total by $11,000,000.

WILLIAM J. MCDONALD, of Paris, Texas, has bequeathed the sum of $1,490,000 to the University of Texas, to be used for the purpose of building and equipping an astronomical observatory to bear his name.

THEODORE P. SANXAY, of Iowa City, Ia., has bequeathed to Princeton University the sum of $160,353, and the sum of $15,000 to Iowa State University.

OF the sum of $40,000 appropriated by the last Colorado legislature for experimental purposes, the Colorado School of Mines has been awarded $20,000 for work at its experimental plant.

DR. RAYMOND A. PEARSON, formerly president of the Iowa State College, has accepted the presidency of the University of Maryland. He will succeed Dr. Albert F. Woods, who was recently appointed director of scientific work in the U. S. Department of Agriculture.

PROFESSOR J. ORVIS KELLER, head of the industrial engineering department at Pennsylvania State College, has been appointed head of the engineering extension department in the college.

WILLIAM WALTER RANKIN, JR., professor of mathematics at Agnes Scott College, Decatur, Georgia, has been appointed professor of mathematics at Duke University. He will take up his new duties next fall.

PROFESSOR C. D. SMITH has resumed the duties of head of the department of mathematics at Louisiana College after a year's leave of absence spent at the University of Iowa.

A. J. RIKER has been promoted to assistant professor of plant pathology at the University of Wisconsin.

AT the University of Edinburgh, Colonel P. S. Lelean, until recently professor of hygiene in the Royal Army Medical College, has been appointed to the Bruce and John Usher chair of public health and Dr. William Robertson, medical officer of health of the City of Edinburgh, has been made director of instruction in sanitary administration.

DISCUSSION AND CORRESPONDENCE

SUPPORT OF THE U. S. GEOLOGICAL SURVEY AND OTHER COOPERATING AGENCIES

AT their fall meeting held in Pennsylvania, the Association of American State Geologists discussed the question of the duties of the federal government and the state governments in scientific work, and the necessity of certain of this work being carried on adequately and continuously by the federal government. A letter was therefore prepared and addressed to Honorable Calvin Coolidge, President of the United States, requesting his earnest consideration of the needs of the scientific personnel of the government, and his support of a financial program which will permit this work to be carried on effectively. The body of the letter, which was transmitted by Mr. W. A. Nelson, president of the Association of American State Geologists, reads as follows:

It was with great pleasure that we noticed in your [President Coolidge's] message to Congress the following statement: "We should constantly engage in scientific studies of our future requirements and adopt an orderly program for their service.

Most of the States of the Union maintain State Geological Surveys. These Surveys have each a staff adequate in the main to deal with the general problems within the State. Each State, however, presents problems which can be solved only by specialists, whose work

is confined within narrow limits to certain divisions of the science of geology, in which very detailed knowledge and country-wide experience are necessary. The State Surveys are not able individually or independently to maintain a staff of such specialists and have therefore long maintained cooperative agreements with the U. S. Geological Survey, by which these special problems are referred to the specialists of the National Survey. Many of these problems are of fundamental importance and their solution is necessary to reliable economic work.

Further, the areal and structural geologic work in the various States is dependent on the progress and completion of the topographic maps of the United States, which are made by the Topographic Branch of the U. S. Geological Survey. The States usually have contributed one half of the cost of this work, the Federal Survey the other half, both parties to this cooperation having approximately equal need for the results.

Therefore, the Association of American State Geologists, in the interest of their work, ask that you use your good office to strengthen the research and specialistic staff of the U. S. Geological Survey, Department of the Interior, and to promote and hasten the topographic mapping in conformity with the plan recently adopted by Congress and approved by yourself. What has been said about specialists in the U. S. Geological Survey is equally true of specialists in the U. S. Bureau of Mines, the Bureau of Soils, and other Federal organizations with which the members of our association cooperate.

The justification of the above letter has recently been emphasized by the action of the director of the Budget Bureau in ignoring the provisions of the Temple Bill, "An Act to provide for the completion of the topographical survey of the United States," which contemplates an appropriation of $950,000 for the next fiscal year as the first year's requirement of the twenty-year program. The budget bureau director recommended $477,000.

On January 9, the chairman of the Subcommittee on Appropriations for the Department of the Interior, House of Representatives, represented that the provisions of the Temple bill would be met if the federal government met the sum total of the state allotments. On this basis the House on January 9 passed the appropriations bill carrying an amount of $525,000 for topographic mapping. This misinterpretation of the Temple bill is now being protested before the Senate by the engineering societies of the country and the Association of American State Geologists who point out that in the hearings of the Temple bill it was contemplated that the federal expenditures would be nearly three times those of the states. These organizations are therefore urging that the full appropriation of $950,000, which can be economically and effectively used, be made in accordance with the provisions of the Temple bill, to fully sustain the twenty-year program.

M. M. LEIGHTON,
Secretary,
Association of American State Geologists

EVOLUTION AND THE UNIVERSITY OF NEBRASKA

REFERRING to Franklin D. Barker's communication in SCIENCE of January fifteenth regarding the quotation from the New York *Times* of November 29, 1925, may I quote the actual passage from my recent address, "How to Teach Evolution in the Schools," as printed in *School and Society,* January 9, 1926:

"In a recent journey through the politically progressive state of Nebraska I was amazed to learn from the senior professor of geology, Erwin H. Barbour, that even in the university there was a hush on the word 'evolution.' I was not less amazed to learn from an extremely able high-school teacher in the western part of the same state that the word 'evolution' must not be used at all; so powerful is the influence of a certain class of theological teachers on their congregations, so strong is the influence of these congregations with their representatives in the state legislature and so potent are these representatives in affecting state appropriations for education that no teacher in the whole state of Nebraska is entirely free to be sincere but is more or less obliged to dissemble his real beliefs."

I deeply regret if in any way I misrepresented the meaning of my honored friend, Professor Erwin H. Barbour, or the general atmosphere in the University of Nebraska, an institution for which I have the greatest admiration and with which I have long been in most friendly association through Professor Barbour and other friends. The concluding words are somewhat ambiguous; what I intended to say is that no (school) teacher in the state is entirely free to be sincere.

As regards the University of Nebraska, I am only too happy to learn from Professor Barker that I was mistaken and that the teaching of evolution as a law, no longer as a theory, is entirely free. I trust this will soon be the case among all the school teachers of the state of Nebraska, as well as among other school teachers all over the United States, to whom my address was especially directed.

HENRY FAIRFIELD OSBORN
COLUMBIA UNIVERSITY

LOSSES IN TROUT FRY AFTER DISTRIBUTION

SINCE sending to SCIENCE my article on this subject I have received from Mr. White a summary of

his seining experiments on Forbes' Brook, Prince Edward Island, for the past summer.

During the first week of July four thousand trout fry were distributed along a length of about one quarter of a mile of this stream. It was seined three months later with the following results:

Trout, yearlings and older	319
Fundulus	82
Atlantic salmon parr	33
Stickleback	16,152
Total	16,586
Surviving trout fry	1,064

To test the efficacy of the seining twenty-five marked fingerlings were dropped into the brook at a point which was considered a fair average as regards difficulties of seining. In three quarters of an hour twenty-four of them had been removed by the seine, which represents an error of 4 per cent. for this method of recovering fry.

The superintendent of fish culture for the Dominion of Canada assures us that Forbes' Brook is a typical trout stream. The approximate loss of trout fry in Prince Edward Island streams will average therefore about 73 per cent. for three months.

QUERIES

(1) Are we feeding trout fry to older trout and to inferior fish? What rôle is played by the 16,152 stickleback?

(2) Are the fry being starved to death through shortage of natural food for 16,586 fish, apart from the food required for the 4,000 fry?

(3) How many of the surviving 1,064 fry (if any) will be alive when they shall have become four years old?

(4) Should we continue to distribute trout fry irrespective of the presence in streams of many enemy and competitor fish?

A. P. KNIGHT,
Chairman, Biological Board of Canada
KINGSTON, ONTARIO
December, 1925

WORK ON SPHENODON

IN the issue of SCIENCE for December 25, 1925, there appeared under the heading of "Science News" an item concerning work in the University of Chicago on *Sphenodon*. It seems desirable in this connection to make the following statement: In 1922 an expedition from this university visited New Zealand and brought back four living specimens of *Sphenodon* as well as one preserved in fluid, and on the basis of this material and the literature procurable we have undertaken a monographic account of this interesting reptile. Papers have already been prepared on the muscular system, digestive system and habits in captivity. Work on the nervous system, particularly the brain, has been going on for six or eight months under the supervision of Dr. Gilbert L. Houser of this university. Other papers will deal with the urogenital system, the blood supply, the skeleton, etc. While of course no one can claim any monopoly in scientific investigation this statement will show that the work on *Sphenodon* has already been going on for several years at the University of Iowa.

C. C. NUTTING
STATE UNIVERSITY OF IOWA

THE FOURTH EDITION OF THE BIOGRAPHICAL DIRECTORY OF THE AMERICAN MEN OF SCIENCE

A FOURTH edition of the *Biographical Directory of American Men of Science* will be published as soon as the compilation can be made and about five years after the publication of the third edition, which was issued in 1921. The work is intended to be a contribution to the organization of science in America, and the editor will greatly appreciate the assistance of scientific men in making its contents accurate and complete. Those whose biographies appear in the third edition have received or will later receive copies of the sketches for correction which should be promptly returned. The editor will be under obligations to scientific men who will send sketches of those who should be included, or let us have their names and addresses. All those engaged in scientific work whose biographies are not included in the third edition are requested to send the information needed. For this purpose the blank that is given on an advertising page (xiii) of the current issue of SCIENCE may be used.

It is intended that each entry shall contain information as follows:

1. The full name with title and mail address, the part of the name ordinarily omitted in correspondence being in parentheses.

2. The department of investigation given in italics.

3. The place and date of birth, including month and day.

4. Education and degrees, including honorary degrees, with dates.

5. Positions or professional occupation with dates, the present position being given in italics.

6. Temporary and minor positions; scientific awards and honors; expectations, etc.

7. Membership in scientific societies with offices and dates at which they were held.

8. Chief subjects in which research has been published or is now in progress.

All those in North America should be included in the book who have made contributions to the natural and exact sciences. The standards are expected to be about the same as those of fellowship in the American Association for the Advancement of Science or membership in the national scientific societies which require research work as a qualification.

The compilation of the new edition will of necessity involve much labor; this will be materially lightened if men of science will give the assistance here requested.

J. McKEEN CATTELL

3939 GRAND CENTRAL TERMINAL,
NEW YORK, N. Y.

SCIENTIFIC BOOKS

Ancient Hunters and Their Modern Representatives. By W. J. SOLLAS, professor of geology and paleontology in the University of Oxford. Third Edition, Revised. London: Macmillan and Company, 1924.

THOSE who have read the first (1911) and second (1915) editions of "Ancient Hunters" have another treat in store for them in the third edition. The plan of the work remains the same, except for minor details. The number of the chapters and their headings are identical, with the exception of Chapter V, the title of which has been changed from "The Most Ancient Hunters" to "Lower Paleolithic Chellean and Acheulian Ages"; to this chapter the discussion of Piltdown Man and Heidelberg Man has been transferred from Chapter II. At the end of the last chapter there has been added a chronological table, not found in the previous edition.

The chapters have been expanded largely through the addition of new material, so that the reader now has a volume of 689 pages and 368 illustrations, in comparison with 591 pages and 314 illustrations of the second edition. In a perusal of the pages, one notes evidences of revision as well as expansion. For example, his attitude on the subject of eoliths has undergone a change. After a brief study of the Westlake collection from Cantal, Sollas concludes that "in the present state of our knowledge, I think the balance of probabilities distinctly points to the conclusion that these eoliths are the work of an intelligent being."

The large bone implement from Piltdown is referred to the Chellean Epoch and is supposed to be of the same age as the skeletal remains of *Eoanthropus*. The pointed end of a wooden spear found by Hazzledine Warren in a bed containing remains of *Elephas antiquus* at Clacton-on-Sea is thought to be of a somewhat later age, namely, the Lower Acheulian Epoch. Sollas accepts the evidence for a warm stage ushering in the Mousterian Epoch.

Depéret's theories regarding strand-like correlations with glacial phenomena are accepted, which will please some critics and displease others. It will be recalled that Depéret's nomenclature for the old shore lines beginning with the highest are: Sicilian (90 meters), Milazzian (60 m.), Tyrrhenian (30 m.) and Monastirian (20 m.). Sollas would refer *Pithecanthropus* to the Lower Sicilian, *Eoanthropus* to the Lower Tyrrhenian and Neanderthal man to the Lower Monastirian. It is evident therefore that the author has not suppressed his personal opinions on controverted questions; granting that some of these may be wrong, there is much in the book to commend.

The numerous illustrations add materially to the text, although some of the borrowed ones have suffered somewhat in the reproduction process and the sketch map (Figure 106) of the district of Les Eyzies is antiquated.

GEORGE GRANT MACCURDY

YALE UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE METHOD FOR MAKING DIFFERENTIAL COUNTS OF SMALL SPORES

EVERY one who has attempted differential counts of small spores by counting the number of each kind in a field knows how difficult it is to keep from counting the same spores over and over and how tedious the procedure becomes if there are many counts to be made. For many individuals this procedure is subject to considerable experimental error. Incidentally, counting the spores in a field or part of a field and computing therefrom the percentage of each is a slow process. The following method requires two persons, an observer and a recorder, but is very rapid and eliminates some of the experimental error. Select a thin round cover glass and with India ink rule across it two parallel lines a millimeter or less apart. In the middle of the cover draw a third line perpendicular to and joining the first two, thus forming a narrow letter H in the center of the cover. Drop the cover onto the "stop" of an ordinary 10 X eyepiece as though inserting a micrometer disc. Such a cover, unlike an ordinary micrometer disc, does not perceptibly interfere with definition, a factor of importance when observing hyalin spores. Place the slide, which should be prepared so as to give a fairly uniform distribution of spores, in position on a mechanical stage having convenient right and left movement. Arrange the eyepiece containing the cover slip so that the parallel lines coincide with the right and left movement of the stage. With a 3 or 4 mm lens, select, in the region well to the left of the center

of the preparation, a field showing abundant spores. Suppose there are five kinds of spores in the mount; assign a letter to each kind. Move the slide from left to right so that the spores appear to be slowly travelling along between the two lines. Call off to an assistant the proper letter for each spore passing by the vertical line within the parallel lines. Let the assistant record the letters on plotting paper conveniently divided off into 50 or 100 squares. This method will enable a record to be made almost as fast as one can talk. Of course, simply counting the letters will give the percentage of each type of spore. This procedure will obviously eliminate some of the experimental error common in "field counts," and is much faster since there is no pause to answer the question, "Have I counted that one before?" The writer is using the method in studying a species of Fusarium.

FRANK P. MCWHORTER
VIRGINIA TRUCK EXPERIMENT STATION,
NORFOLK, VIRGINIA

CULTURE MEDIUM FOR THE CILIATE LACRYMARIA

LACRYMARIA has been observed by numerous biologists who noted its form and structures, "its phenomenal power of elongation, its wonderful elasticity and its great freedom of movement,"[1] but no one has as yet made a thorough study of this remarkable organism. This is no doubt due to its scarcity.

Mast, who has had wide experience in collecting protozoa, says ('11, p. 230): "Lacrymaria is relatively scarce in nature. It is occasionally found in cultures containing decaying aquatic plants but never in great numbers. One rarely finds more than two or three specimens in a drop of solution." And no one has heretofore succeeded in cultivating it in the laboratory. Professor Mast called my attention to this and suggested the following experiments:

Various concentrations of (1) timothy hay, (2) wheat, (2) beef extract and (4) malted milk in distilled water were prepared in two sets, one of which was boiled and the other not. All were seeded with Lacrymaria and examined from time to time for several weeks.

The Lacrymaria died out, without any apparent increase in numbers, in all the cultures except those containing malted milk, 1–5 mgr to 100 cc water. The best growth was obtained in cultures containing 3 mgr malted milk to 100 cc water. In some of these the Lacrymaria became very abundant and continued to thrive for more than six weeks without adding anything to the cultures.

These cultures contained Halteria and another similar organism which was not identified and numerous bacteria. The Lacrymaria were observed to capture Halteria, but they appeared to feed mostly on the other organisms.

Y. IBARA
ZOOLOGICAL LABORATORY,
THE JOHNS HOPKINS UNIVERSITY

[1] Mast, 1911, "Habits and Reactions of the Ciliate Lacrymaria," *Journ. Animal Behavior*, Vol. 1, pp. 229–243.

SPECIAL ARTICLES

A PRELIMINARY REPORT ON THE CULTIVATION OF THE MICROBE OF OROYA FEVER

OROYA fever, or Carrion's disease, is a highly fatal infection endemic in certain regions of Peru. Its most striking clinical feature is a rapidly progressing severe anemia, associated with febrile reactions. In the red blood cells of patients suffering from the disease Barton found, in 1905, peculiar bacilliform elements, the specificity of which has been confirmed by Barton's subsequent observations and those of later investigators. Strong, Tyzzer, Sellards, Brues and Gastiaburu concluded that these bodies are of protozoan nature and proposed for them the name of *Bartonella bacilliformis*. Their cultivation, however, had not been achieved, and the problem offered opportunity for the trial of procedures recently developed for the cultivation of certain spirochetes, flagellates and rickettsia-like microorganisms.

In the summer of 1925 one of us (B.) went to Lima and secured the material for study. Through the generous permission of Dr. Olaechea, of the Dos de Mayo Hospital, Lima, blood was withdrawn into citrate solution from a case of oroya fever and brought to the Rockefeller Institute, where the cultural and experimental work has been carried out.

Of the various media employed, including those which had been found suitable for the cultivation of anaerobic treponemata, as well as aerobic media used for the cultivation of the leptospiras, flagellates and rickettsia-like microorganisms, only the aerobic media, solid or semisolid, containing blood or serum yielded growth of *Bartonella bacilliformis*. The initial cultures were obtained both on leptospira medium and on blood agar slants (20 to 30 per cent. of defibrinated horse blood) containing certain carbohydrates. The organism grew in pure condition on the first attempt, and pure cultures have been repeatedly obtained from the original citrated blood. Growth occurred at 37° C. and also at 28° C. within 48 to 72 hours. Subcultures were readily obtained on similar media, and the strain has been maintained in the laboratory since the beginning of October, 1925.

The only change produced in the leptospira medium is a very delicate grayish, often minutely granular, appearance of the surface layer. The zone in which growth occurs gradually becomes evident as a faint gray haze, which, within 10 to 14 days, extends as far as a centimeter below the surface and resembles the appearance of growth of the leptospiras on this medium. The colonies on the surface of blood slants are almost microscopic during the first few days and appear translucent, slightly raised and discrete. They may attain a diameter of 0.2 to 0.5 mm., while still remaining discrete and practically colorless, reaching their maximum size in about three days at 37° C. and seven days at 28° C.

Bartonella bacilliformis is a motile organism but this characteristic is lost as the cultures grow older. In form it is minute and pleomorphic, ranging from round, oval and lanceolate to rod shapes. There is a marked tendency for the individuals to clump together in masses of hundreds and perhaps thousands. The organism is Gram negative and stains reddish violet with Giemsa's solution. It varies in width from less than 0.2 to 0.5 μ and in length from 0.3 to 2.5 μ.

Inoculation of cultures of *Bartonella bacilliformis* into young rhesus monkeys induced intermittent fever lasting many weeks. Typical endoglobular forms of *Bartonella bacilliformis* have been demonstrated in the red blood corpuscles of these animals. Intradermic inoculation of the culture into the eyebrows gave rise to highly vascular nodules, resembling the nodules of experimental verruga induced in monkeys by previous investigators. *Bartonella bacilliformis* can readily be recovered in pure culture from the blood, lymph glands, spleen and nodules, and passages from animal to animal are easily carried on.

A detailed report of the foregoing experiments will appear in a forthcoming number of the *Journal of Experimental Medicine*.

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SEASONAL AND REGIONAL VARIATIONS IN CURLY-TOP OF SUGAR BEETS

OBSERVATIONS made during the past season (1925) in various sugar-beet growing areas in the states west of the Rocky Mountains revealed striking contrasts between different localities in the amount of curly-top occurring. In southern California there was more curly-top last year than has occurred before in the eight years during which the fields have been observed. In the Salinas Valley and also in the sugar-beet areas of the Sacramento Valley (even including the delta region which has previously been relatively free from curly-top damage), the damage was comparable to that resulting in the years of worst outbreaks.

By contrast with conditions in California the condition of the crop in the intermountain region of the northwest was the most favorable which has been seen in a number of years. In the Yakima Valley of Washington in 1924 approximately only 25 per cent. of a normal crop was harvested from a large acreage. The losses from curly-top in this valley have been so serious and frequent in occurrence that this past year beet-growing was practically abandoned; three fields, comprising only about twenty acres, were planted this past season. In southern Idaho, where in 1924 somewhat over ten thousand acres were ruined by curly-top, the crop in 1925 was in excellent condition. In 1924 enormous numbers of beet leafhoppers, which are the only known natural agents transmitting the virus of curly-top, invaded the beet fields of this area in the latter part of May and early June. In 1925 there had been no general flight of the insects into the cultivated areas, at least up to July 1. In Utah there was this year relatively little curly-top damage, whereas the only previously recorded outbreak of curly-top in Utah which can be compared in seriousness with that of 1924 occurred in 1905.

The observations which have been given when considered in connection with the climatic conditions which prevailed during the winters of 1923–24 and 1924–25 strongly support the idea that the abundance or scarcity of beet leafhoppers and presumably also the amount of curly-top disease in the sugar beet fields is determined by the climatic conditions of a given area rather than that the severe outbreaks occur simultaneously throughout the range of the insect at periodic intervals.

In the northwest area the winter of 1923–24 was relatively mild and the precipitation was decidedly below normal. Undoubtedly this allowed a large proportion of the leafhoppers to survive the winter and forced them to leave the drying vegetation of the deserts early in the spring. The winter of 1924–25 was severe so that probably a relatively small proportion of the insects survived. The precipitation was relatively high and continued late into the spring so that favorable conditions in the natural breeding grounds delayed the movement of the insects into the cultivated areas.

In the lower half of California, on the other hand, which includes the principal natural breeding areas of the insect in the state, both the winters referred to were mild and with subnormal rainfall. The seasons of 1924 and 1925 were both characterized by outbreaks of the leafhopper and curly-top, though the